Chemistry Challenge Practice Exam #1

Multiple Choice
Identify the letter of the choice that best completes the statement or answers the question.

____ 1. Express the sum of 7.68 m and 5.0 m using the correct number of significant digits.
a. 12.68 m
b. 12.7 m
c. 13 m
d. 10 m

____ 2. What is the measurement 111.009 mm rounded off to four significant digits?
a. 111 mm
b. 111.0 mm
c. 111.01 mm
d. 110 mm

____ 3. Using the periodic table, determine the number of neutrons in ^{16}O.
a. 4
b. 8
c. 16
d. 24

____ 4. Which of the following isotopes has the same number of neutrons as phosphorus-31?
a. $^{32}_{15}P$
b. $^{32}_{16}S$
c. $^{29}_{14}Si$
d. $^{28}_{14}Si$

____ 5. When an electron moves from a lower to a higher energy level, the electron ____.
a. always doubles its energy
b. absorbs a continuously variable amount of energy
c. absorbs a quantum of energy
d. moves closer to the nucleus

____ 6. What is the electron configuration of potassium?
a. $1s^2 2s^2 2p^2 3s^2 3p^2 4s^1$
b. $1s^2 2s^2 2p^{10} 3s^2 3p^3$
c. $1s^2 2s^2 3s^2 3p^6 3d^1$
d. $1s^2 2s^2 2p^6 3s^2 3p^6 4s^1$

____ 7. Which of the following elements is a transition metal?
a. cesium
b. copper
c. tellurium
d. tin

____ 8. Atomic size generally ____.
a. increases as you move from left to right across a period
b. decreases as you move from top to bottom within a group
c. remains constant within a period
d. decreases as you move from left to right across a period

____ 9. Which of the following elements has the smallest first ionization energy?
a. sodium
b. calcium
c. potassium
d. magnesium

____ 10. Which of the following statements correctly compares the relative size of an ion to its neutral atom?
a. The radius of an anion is greater than the radius of its neutral atom.
b. The radius of an anion is identical to the radius of its neutral atom.
c. The radius of a cation is greater than the radius of its neutral atom.
d. The radius of a cation is identical to the radius of its neutral atom.

____ 11. As you move from left to right across the second period of the periodic table ____.
a. ionization energy increases
b. atomic radii increase
c. electronegativity decreases
d. atomic mass decreases

____ 12. What is the electron configuration of the calcium ion?
a. $1s^2 2s^2 2p^6 3s^2 3p^6$
b. $1s^2 2s^2 2p^6 3s^2 3p^4 4s^2$
c. $1s^2 2s^2 2p^6 3s^2 3p^5 4s^1$
d. $1s^2 2s^2 2p^6 3s^2$

____ 13. How many valence electrons are in an atom of phosphorus?
a. 2
b. 3
c. 4
d. 5

____ 14. How many valence electrons are in an atom of magnesium?
a. 2
b. 3
c. 4
d. 5

____ 15. What is the formula unit of sodium nitride?
a. NaN
b. Na_2N
c. Na_3N
d. NaN_3

____ 16. Which of the following compounds has the formula KNO_3?
a. potassium nitrate
b. potassium nitride
c. potassium nitrite
d. potassium nitrogen oxide

____ 17. Which of these elements does not exist as a diatomic molecule?
a. Ne
b. F
c. H
d. I

____ 18. A molecule with a single covalent bond is ____.
a. CO_2
b. Cl_2
c. CO
d. N_2

____ 19. Which of the following formulas represents an ionic compound?
a. CS_2
b. BaI_2
c. N_2O_4
d. PCl_3

____ 20. Sulfur hexafluoride is an example of a ____.
a. monatomic ion
b. polyatomic ion
c. binary compound
d. polyatomic compound

____ 21. Which of the following compounds contains the lead(II) ion?
a. PbO
b. $PbCl_4$
c. Pb_2O
d. Pb_2S

____ 22. Which of the following elements exists as a diatomic molecule?
a. neon
b. lithium
c. nitrogen
d. sulfur

____ 23. How many moles of tungsten atoms are in 4.8×10^{25} atoms of tungsten?
a. 8.0×10^{2} moles
b. 8.0×10^{1} moles
c. 1.3×10^{-1} moles
d. 1.3×10^{-2} moles

____ 24. How many moles of silver atoms are in 1.8×10^{20} atoms of silver?
a. 3.0×10^{-4}
b. 3.3×10^{-3}
c. 3.0×10^{2}
d. 1.1×10^{44}

____ 25. What is the molar mass of $(NH_4)_2CO_3$?
a. 144 g
b. 138 g
c. 96 g
d. 78 g

____ 26. What is the percent composition of carbon, in heptane, C_7H_{16}?
a. 12%
b. 19%
c. 68%
d. 84%

____ 27. Which of the following is the correct skeleton equation for the reaction that takes place when solid phosphorus combines with oxygen gas to form diphosphorus pentoxide?
a. $P(s) + O_2(g) \rightarrow PO_2(g)$
b. $P(s) + O(g) \rightarrow P_5O_2(g)$
c. $P(s) + O_2(g) \rightarrow P_2O_5(s)$
d. $P_2O_5(s) \rightarrow P_2(s) + O_2(g)$

____ 28. Chemical equations must be balanced to satisfy ____.
a. the law of definite proportions
b. the law of multiple proportions
c. the law of conservation of mass
d. Avogadro's principle

____ 29. What are the missing coefficients for the skeleton equation below?
$Cr(s) + Fe(NO_3)_2(aq) \rightarrow Fe(s) + Cr(NO_3)_3(aq)$
a. 4, 6, 6, 2
b. 2, 3, 2, 3
c. 2, 3, 3, 2
d. 1, 3, 3, 1

____ 30. Which of the following is an INCORRECT interpretation of the balanced equation shown below?
$2S(s) + 3O_2(g) \rightarrow 2SO_3(g)$

a. 2 atoms S + 3 molecules $O_2 \rightarrow$ 2 molecules SO_3

b. 2 g S + 3 g $O_2 \rightarrow$ 2 g SO_3

c. 2 mol S + 3 mol $O_2 \rightarrow$ 2 mol SO_3

d. none of the above

____ 31. How many moles of glucose, $C_6H_{12}O_6$, can be "burned" biologically when 10.0 mol of oxygen is available?

$C_6H_{12}O_6(s) + 6O_2(g) \rightarrow 6CO_2(g) + 6H_2O(l)$

a. 0.938 mol
b. 1.67 mol
c. 53.3 mol
d. 60.0 mol

____ 32. At STP, how many liters of oxygen are required to react completely with 3.6 liters of hydrogen to form water?
$2H_2(g) + O_2(g) \rightarrow 2H_2O(g)$

a. 1.8 L
b. 3.6 L
c. 2.0 L
d. 2.4 L

____ 33. How are conditions of pressure and temperature, at which two phases coexist in equilibrium, shown on a phase diagram?

a. by a line separating the phases
b. by the endpoints of the line segment separating the phases
c. by the planar regions between lines in the diagram
d. by a triple point on the diagram

____ 34. As the temperature of a fixed volume of a gas increases, the pressure will ____.

a. vary inversely
b. decrease
c. not change
d. increase

____ 35. Which of the following compounds is a nonelectrolyte?

a. sodium bromide
b. magnesium sulfate
c. copper chloride
d. carbon tetrachloride

____ 36. What mass of Na_2SO_4 is needed to make 2.5 L of 2.0*M* solution? (Na = 23 g; S = 32 g; O = 16 g)

a. 178 g
b. 284 g
c. 356 g
d. 710 g

____ 37. What is the number of moles of K+ ions are present in 250 mL of a 0.4*M* KCl solution?

a. 0.1 mol
b. 0.16 mol
c. 0.62 mol
d. 1.6 mol

____ 38. To 225 mL of a 0.80*M* solution of KI, a student adds enough water to make 1.0 L of a more dilute KI solution. What is the molarity of the new solution?

a. 180*M*
b. 2.8*M*
c. 0.35*M*
d. 0.18*M*

____ 39. Why does a higher temperature cause a reaction to go faster?

a. There are more collisions per second only.
b. Collisions occur with greater energy only.
c. There are more collisions per second and the collisions are of greater energy.
d. There are more collisions per second or the collisions are of greater energy.

____ 40. Which of these solutions is the most basic?

a. $[H^+] = 1 \times 10^{-2} M$
b. $[OH^-] = 1 \times 10^{-4} M$
c. $[H^+] = 1 \times 10^{-11} M$
d. $[OH^-] = 1 \times 10^{-13} M$

____ 41. What volume, in liters, of 0.40 M NaCl solution contains 0.10 moles of NaCl

a. 0.040
b. 0.10
c. 0.25
d. 0.40

____ 42. Which substance is liquid at room temperature and 1 atmosphere pressure?

a. sulfur
b. mercury
c. silicon
d. barium

____ 43. Groups of elements _____

a. have the same number of isomers.
b. have the same principle quantum number (n).
c. have the same number of valence electrons.
d. both (b) and (c) are correct.

____ 44. If 0.015 moles of NaOH is added to 0.015 moles of H_2SO_4,

a. an acidic solution results.
b. a basic solution results.
c. a neutral solution results.
d. H_2 gas is formed.

____ 45. If 1 part water is mixed with 3 parts 0.2 M NaCl (aq), what is the molarity of this mixture?

a. 0.67 M
b. 0.5 M
c. 0.15 M
d. 0.2 M

____ 46. Which process has a negative value of ΔG at room temperature and 1 atm pressure?

a. water freezing
b. water boiling
c. ice melting
d. both (a) and (b) are correct

____ 47. An irregularly shaped object weighed 122.9 g. When placed in a graduated cylinder that originally contained 24.3 ml of water, the resulting volume was 35.7 ml. What is the density of the object?

a. 5.06 g/ml
b. 3.44 g/ml
c. 10.8 g/ml
d. 20.5 g/ml

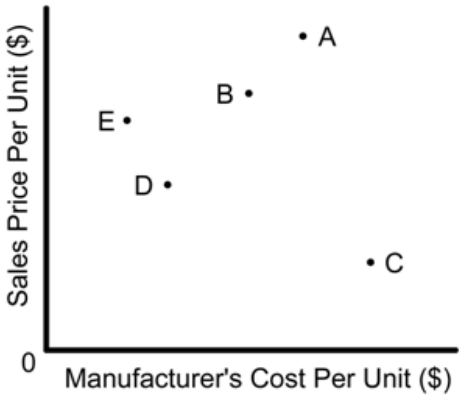
____ 48. If one 5-kg log is burned in a first fireplace, and two 5-kg logs are burned in a second fireplace, then

a. slightly more heat is produced in the first fireplace.
b. twice as much heat is produced in the first fireplace.
c. slightly more heat is produced in the second fireplace.
d. twice as much heat is produced in the second fireplace.
e. the same amount of heat will be produced in each fireplace.

____ 49. An example of a pure substance is

a. uranium
b. sodium chloride
c. pure water
d. carbon dioxide
e. all of the above

____ 50. Companies A, B, C, D, and E all manufacture and sell a similar product. The graph below compares manufacturing costs and sales prices per unit among the five companies. If all five companies have sold the same number of units, which company has earned the greatest profit from those sales?



a. A
b. B
c. C
d. D
e. E

____ 51. A parking garage charges $2.00 for the first hour and $1.50 for each additional hour. Saturday and Sunday, the rates are decreased by 50%. How much does it cost to park a car from 5 p.m. on Friday until 2 a.m. on Saturday?

a. $9.50
b. $9.75
c. $12.50
d. $12.75
e. $14.00

____ 52. A television is on sale for $300. If the sale price is 20% less than the regular price, what was the regular price?

a. $240
b. $360
c. $375
d. $600
e. $1,500

____ 53. A chemist has one solution that is 30.% acid and another solution that is 18% acid. How much of each solution should be used to get 300. L of a solution that is 21% acid?

a. 23 L of the 30.% solution and 277 L of the 18% solution
b. 75 L of the 30.% solution and 225 L of the 18% solution
c. 131 L of the 30.% solution and 169 L of the 18% solution
d. 138 L of the 30.% solution and 162 L of the 18% solution
e. 244 L of the 30.% solution and 56 L of the 18% solution

Chemistry Challenge Pracitce Exam #1
Answer Section

MULTIPLE CHOICE

1. B
2. B
3. B
4. B
5. C
6. D
7. B
8. D
9. C
10. A
11. A
12. A
13. D
14. A
15. C
16. A
17. A
18. B
19. B
20. C
21. A
22. C
23. B
24. A
25. C
26. D
27. C
28. C
29. C
30. B
31. B
32. A
33. A
34. D
35. D
36. D
37. A
38. D
39. C
40. C

41. C
42. B
43. C
44. A
45. D
46. C
47. C
48. D
49. E
50. E
51. C
52. C
53. B